# Village of Barrington

## CN Railway Traffic Impact Study Update

### Final Report

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## I. INTRODUCTION

This study is an update of a previous traffic impact study ("Barrington TIS") that the Village of Barrington commissioned in 2007 to evaluate the impacts of the proposed Canadian National (CN) Railway acquisition of the Elgin, Joliet & Eastern (EJ&E) Railway Company ("Acquisition"). The previous study compared existing conditions in 2007 to predicted 2015 vehicular traffic and 2015 post- Acquisition rail traffic in order to determine the effects of the Acquisition on traffic mobility and congestion in the Village. The current Traffic Impact Study Update ("TIS Update") builds on the previous study's computer models and updates them based upon actual CN train operational data that was collected within the Village in 2011. This study also reviews the methodology employed in the *Village of Barrington Traffic Operational Analysis* ("VOBTOA") that was relied upon by the STB's Section of Environmental Analysis ("SEA") in preparing the Final Environmental Impact Statement ("FEIS") for the Acquisition. The VOBTOA was prepared by HDR, Inc. ("HDR"), the STB's engineering consulting firm that assisted in the preparation of the environmental analysis and public documents.

## II. PURPOSE OF TRAFFIC IMPACT STUDY UPDATE

The *Village of Barrington CN Railway Traffic Impact Study Update* has five primary objectives:

- Review and analyze the methodology used by HDR in developing the VOBTOA that was included as Appendix A-5 in the FEIS.

- Calculate the 24-hour delay impacts of the Acquisition at IL Route 59 and U.S. Route 14 in Barrington using the VISSIM computer modeling software program which, as SEA has acknowledged in the FEIS, is an appropriate tool for use in complex urban environments such as that in Barrington.

- Update the VISSIM analyses developed for the original Barrington TIS to reflect the characteristics of actual CN Railway train operations within the Village that were measured earlier this year.

- Based on characteristics of actual CN train operations, determine the traffic operational benefits of constructing a grade separation on U.S. Route 14 at the CN Railway crossing

- Use the same VISSIM measurement tool to calculate the 24-hour delay impacts of the Acquisition at U.S. Route 34 in the City of Aurora and compare the delay values to those calculated in Barrington. The U.S. Route 34 crossing is similar in many ways to the U.S. 14 crossing in Barrington and is also a location SEA called for construction of a grade separation to mitigate the substantial impacts of the EJ&E Acquisition that were identified in the FEIS.

## III. SCOPE OF STUDY

The general scope of the 2011 *Village of Barrington CN Railway Traffic Impact Study Update* is as follows:

- Review the DEIS and FEIS methodologies and findings regarding roadway impacts.
- Collect existing roadway and railway data.
- Develop and calibrate a VISSIM model that simulates 24 hours of operation of the existing roadway and railroad network in the Village of Barrington and in the City of Aurora.
- Forecast future traffic volumes on the area roadway network.
- Develop VISSIM models for Proposed Action (i.e. post-Acquisition) scenarios and analyze impacts of additional trains on the roadway network in both communities.
- Prepare a report summarizing the findings of the traffic engineering studies.

The study area for the 2011 TIS Update in Barrington is depicted in Exhibit A-1 of Appendix A. VISSIM models were run for the following conditions and Post-Acquisition scenarios:

- 2007 Existing Conditions (2007 traffic with 5 EJ&E trains).
- 2015 No Acquisition Conditions (2015 traffic with 5 EJ&E trains).
- 2015 Post-Acquisition – Scenario 1 (2015 traffic with 20 CN trains averaging 5,800 feet long, which is the current average length of CN trains operating through Barrington).
- 2015 Post-Acquisition – Scenario 2 (2015 traffic with 17 CN trains averaging 6,800 feet long and 3 CN trains averaging 10,000 feet long).
- 2015 Post-Acquisition – Scenario 3 (2015 traffic with 20 CN trains averaging 5,800 feet long and a grade separation at U.S. Route 14 crossing).

Exhibit A-2 in Appendix A depicts the roadways and railways that were included in the VISSIM models. For each condition and/or scenario, models were run to simulate a full 24 hours of a typical weekday.

## IV. UNIQUE CONDITIONS IN VILLAGE OF BARRINGTON

The Village of Barrington has several unique conditions that affect traffic flow over the CN crossings that must be accounted for in any sophisticated methodology for calculating delays. The proximity of rail crossings along the CN line in Barrington necessitates the activation of warning signals at nearby crossings in tandem, rather than providing constant advance warning times at each crossing. This increases railroad delays at some crossings in relation to delays that would be expected if the crossing was isolated.

Signalized intersections are also located nearby each rail crossing. On all three roadways, traffic signals are interconnected into coordinated systems which span the crossing locations. These systems improve the efficiency of traffic flow without trains, but they can limit the arrival and/or discharge of traffic over the railroad crossing after train events do occur. Any methodology that assumes a uniform vehicle arrival rate at the crossings, as well as a uniform discharge rate cannot be applied to the situation in Barrington because neither of these conditions occurs in Barrington.

Finally, the UP rail line crosses the CN Railway just northwest of the downtown and also crosses two of the three major arterial routes in the Village that are crossed by the EJ&E line. Operation of nearly 70 commuter and freight trains per day on the UP line already has a large impact on traffic flow on the same roadways that will be impacted by the Acquisition. During many hours of the day, it will be likely that traffic flow will not have the time to recover from one train event before another train event occurs.

A methodology that does not account for the interactions of the two rail lines or the cumulative effect of successive train events will not adequately address the unique conditions in Barrington and will fail to calculate the full delays that will result from the Acquisition. Because the impact assessments and the Final Recommended Conditions contained in the FEIS were based on delay calculations that did not address these interactions and cumulative effects, those findings were inaccurate.

## V. VISSIM MODELING SOFTWARE

In order to develop accurate estimates[1] of the impacts of the Acquisition on vehicle delays at crossings in Barrington that take into effect the unique conditions in the Village, Civiltech used VISSIM software in both the original 2008 Barrington TIS and this 2011 TIS Update. VISSIM is a powerful microscopic time step and behavior-based simulation program developed to model urban traffic and rail operations. The program models individual driver behaviors and the resulting vehicle interactions to realistically simulate the performance of actual traffic flows. Traffic and rail operations are modeled under actual constraints such as roadway and railway configurations, speed limits, traffic composition, vehicle characteristics, traffic signals, transit stops, train blockages, and driver behaviors, among others.

An extensive number of measures of effectiveness can be extracted from the VISSIM output using its various evaluation settings. The primary performance measure extracted for this study is total vehicle delay over a 24-hour period quantified at each rail crossing, a measure used in the DEIS to determine if highway/railway at-grade crossings would be "substantially affected" by the Acquisition. VISSIM also creates a realistic computerized 3-D animation of its simulations, a feature used for calibration, evaluation, and presentation of models.

[1] The analysis methodology relied upon in the FEIS to calculate roadway delay impacts employed a rudimentary equation for calculating delay that assumes an idealized crossing isolated from any conditions that would influence traffic flow other than the railroad, and which has uniform traffic arrival and departure rates throughout the entire day. The methodology is not accurate in Barrington as it does not consider the effects of nearby traffic signals or signal systems, interactions with another intersecting rail line or the cumulative effects of successive train events, all of which exist at the CN Railway crossings in the Village.

Because of the ability to accurately model complex street network interactions and the resulting vehicular behaviors, calculating delays using VISSIM is superior to the rudimentary methodology used in the DEIS. Furthermore, HDR utilized VISSIM in its Barrington-specific analysis (the VOBTOA[2]) to provide a more detailed analysis of the interaction of trains and vehicular traffic. However, the HDR analysis was narrowly-defined and fell short of what is needed to fully assess impacts because HDR failed to model 24 hours of traffic operation.

### A. VISSIM Input Data

Inputs into the VISSIM model included:

- Roadway characteristics, such as alignments, number of lanes, intersection turn channelization, and speed limits.
- Railway configurations.
- Roadway traffic data (based on 2007 and 2008 Village counts and CMAP forecasts), including vehicle composition percentages.
- Railway train count data, including number, length, speed, and type (commuter vs. freight) of trains.
- Traffic signal timing and phasing plans, including vehicle detection characteristics, time-of-day plans, system plans, and railroad pre-emption settings.
- Railroad warning device settings, including train detection devices.

### B. VISSIM Output Data

Total daily vehicle delay in hours was determined for each of the three highway/railway at-grade crossings of the former EJ&E line within the Village of Barrington study area:

- EJ&E Crossing of Main Street (Lake Cook Road)
- EJ&E Crossing of IL Route 59 (Hough Street)
- EJ&E Crossing of U.S. Route 14 (Northwest Highway)

The delay output from VISSIM includes the cumulative delay from all sources on the roadway network, such as intersection delays, capacity constraints and traffic flow restrictions or interruptions, in addition to railroad crossing delays. Therefore, in order to extract the railroad crossing delays caused by the Acquisition, it is necessary to subtract the cumulative delays measured along an appropriate segment of roadway for a No-Action scenario from the cumulative delays measured along the same segment of roadway for the post-Acquisition scenario. The difference is the railroad crossing delays that are directly attributable to CN freight traffic on the EJ&E following the Acquisition.

## VI. FINAL EIS FINDINGS

On December 5, 2008, the STB issued a Final Environmental Impact Statement that was meant to address all substantive comments received on the DEIS. The FEIS correctly acknowledged "the unique layout of Barrington's streets and two railroads"[3]. Due to these unique conditions, HDR developed the *Village of Barrington Traffic Operational Analysis* which was included as

[2] *See* VOBTOA page 1.
[3] *See* FEIS page 2-39.

Appendix A-5 in the FEIS. HDR's VOBTOA recognized that:[4]

> *A closer review of these conditions was deemed necessary recognizing that vehicular mobility and safety in the Barrington area is a complex issue requiring additional study. Therefore, this more detailed analysis of the interaction of train movements and motorist travel was conducted.*

The VOBTOA employed VISSIM to develop that closer review. However, the VISSIM analyses were conducted for just A.M. and P.M. peak hours rather than over an entire day. During peak hours, the analyses predicted queue length increases of 1,550 feet for the IL Route 59 crossing and 2,100 feet for the U.S. Route 14 crossing[5] as a result of the Acquisition. In fact, at the U.S. Route 14 crossing, the VISSIM simulation showed that the queue created by a single train event in the P.M. peak hour failed to dissipate 20 minutes after the train passed, at which time the simulation was stopped.[6] Despite these substantial increases in peak hour congestion levels, however, the VOBTOA erroneously concluded that *"the increase in train traffic will likely have some impacts on traffic congestion in Barrington but will not considerably worsen traffic congestion or mobility."*[7]

HDR also concluded, albeit erroneously, that:[8]

> *Construction of a grade separation at Hough Street and the EJ&E will not prevent traffic queues on Hough Street, Northwest Highway or Main Street/Lake Cook Street. Therefore construction of a grade separation alone at either the Hough Street or Northwest Highway crossings is not a feasible way to address regional congestion due to capacity constraints at existing signalized intersections.*

As a result, the FEIS did not incorporate any of the VOBTOA VISSIM results into the delay calculations for rail crossings in Barrington to determine substantial effect; and relied instead on the rudimentary delay methodology used previously in the DEIS. In Section 2.5.11 of the FEIS[9], however, SEA concluded that the VOBTOA traffic analysis validated SEA's methodology for evaluating traffic delay and mobility effects and the results confirmed the conclusions SEA reached in the DEIS.

Therefore, in the *Final Recommended Conditions* that pertain to impacts of the Proposed Action in Barrington[10], SEA, based on HDR's analysis, stated that it was:

> *... satisfied that to address the effect on queue length at the intersection of IL 59 and US 14, traffic advisory signs would be useful because the signs would alert drivers not to block the roadway intersection during a train pass.*

Based on its recently concluded 2011 study, Civiltech disagrees with HDR's conclusions in the VOBTOA and SEA's findings and recommendations in the FEIS that pertain to Barrington.

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[4] *See* VOBTOA page 1.
[5] *See* VOBTOA Table 5-5 (page 29) and Table 5-6 (page 36).
[6] *See* VOBTOA Figure 5-12 (page 33).
[7] *See* VOBTOA page 47.
[8] *See* VOBTOA page 48.
[9] *See* FEIS page 2-49.
[10] *See* FEIS Chapter 4, page 4-16.

## VII. MATERIAL ERRORS IN FEIS

HDR's VOBTOA contained several significant material errors and omissions that led to incorrect and/or unsupported conclusions in the FEIS. Though SEA acknowledged that VISSIM is a high-level traffic simulation model and HDR used it to analyze the unique traffic issues in Barrington, HDR analyzed only A.M. and P.M. peak hour conditions on Barrington's street network rather than an entire 24-hour period as required by STB's "substantial effect" criteria. Moreover, the peak hours are times during which CN observes voluntary curfews on freight train movements due to the high levels of commuter train traffic on the UP line. Thus, during peak periods, the delay impacts of the Acquisition would be expected to be minimized, making those periods unrepresentative times upon which to base an assessment of the impact of additional trains.

HDR then compounded this error by averaging vehicle delays over the entire modeled street network rather than over the crossing approach roadway segments (as was done for all other EJ&E crossings to measure substantial effects). The street network modeled in the VOBTOA included 5.8 miles of Village streets, a significant portion of which is well beyond the areas affected by train delays. Since the VISSIM model used in the VOBTOA averaged delays over the entire network, it included delays within areas that were far removed from any of the CN crossings. This method of tabulating delays has the effect of minimizing the proportion of delays that is attributable to railroad operations.

Having measured delays during times of limited train activity and having averaged them over an overly broad area of the street network, the VOBTOA concluded:[11]

> *Results of the Village of Barrington Traffic Operational Analysis show that the increase in train traffic on the EJ&E line will likely have some impacts on traffic congestion in Barrington but will not considerably worsen traffic congestion or mobility. The analysis shows that congestion will worsen and mobility will decline with predictions of continued traffic growth. Under the Proposed Action scenario, network-wide total delay time increased by four (4) percent and five (5) percent during the AM and PM peak periods, respectively, over the No Action scenario.*

HDR concluded that congestion "will not considerably worsen" despite the fact that the VISSIM analyses predicted queue length increases of 1,550 feet and 2,100 feet on Hough Street and U.S. Route 14 respectively. It is unclear how increases in the length of traffic back-ups of between ¼ and ½-mile, or vehicle queues from a single train that take more than 20 minutes to dissipate could be characterized as not considerably worse.

Minimizing the peak hour delay results by averaging them over such a large area of the street network also led SEA to erroneously conclude in Section 2.5 of the Final EIS that:[12]

> *The traffic analysis also validated SEA's methodology for evaluating traffic delay and mobility effects. In general, the results of the traffic analysis confirmed the conclusions that SEA reached in the Draft EIS.*

This conclusion was reached despite the fact that HDR's analysis did not validate any 24-hour DEIS delay results at crossings in Barrington that were calculated using SEA's rudimentary analysis procedure. In light of the unsupported conclusion, the Final Recommended Conditions

[11] *See* VOBTOA page 47.
[12] *See* FEIS page 2-49.

in the Final EIS were based on the original rudimentary delay calculations rather than on any VISSIM analyses in HDR's VOBTOA.

Based on HDR's methodology, SEA also concluded that grade separations in Barrington are not reasonable and feasible alternatives for mitigation. This conclusion was reached without any apparent VISSIM analyses of the delay reduction benefits of grade separation scenarios and was unsupported by any facts or data regarding the feasibility of grade separations.

It should also be noted that, though the FEIS recognized on several occasions the importance of Strategic Regional Arterial (SRA) routes to regional mobility, it only mentioned the fact that IL Route 59 is an SRA route in one instance. The FEIS never acknowledged the fact that U.S. Route 14 is an SRA route. The FEIS noted[13], however, that the SRA designation was an important factor in determining the need for a grade separation at U.S. Route 34.

The combination of material errors and unsupported conclusions contained in the FEIS calls into question whether impacts of the Acquisition on crossings in the Village of Barrington were measured without bias and under the same standards as other crossings on the EJ&E line.

## VIII. 2007 EXISTING CONDITIONS VISSIM MODEL IN BARRINGTON

### A. Model Input Data

Civiltech first developed a VISSIM model to evaluate the same 2007 existing conditions that served as the baseline (pre-Acquisition) conditions that were analyzed in the DEIS. Following is a summary of the data that was collected in order to build the 2007 Existing Conditions VISSIM model that was developed in the original Barrington TIS:

**1. 24-Hour Intersection Turning Movement Counts -** Intersection turning movement counts were conducted at the following seven intersections throughout the downtown study area in June and July of 2008:

- Lake-Cook Road (Main Street) and Hart Road
- Lake-Cook Road (Main Street) and Dundee Avenue
- Lake-Cook Road (Main Street) and Garfield Street
- Lake-Cook Road (Main Street) and IL Route 59 (Hough Street)
- Lake-Cook Road (Main Street) and Cook Street
- U.S. Route 14 (Northwest Highway) and IL Route 59 (Hough Street)
- U.S. Route 14 (Northwest Highway) and Berry Road/Library Driveway

The 2008 counts were conducted using Video Collection Units (VCUs). A VCU is a portable pole-mounted video camera that records the movement of vehicles over a pre-set period of time. The video data is stored on flash memory cards and later uploaded to the manufacturer's server via the internet for data processing and reduction. Turning movement information is returned in one-minute intervals. Vehicle classification and pedestrian volumes are also quantified by the VCUs. Civiltech staff spot-checked the count results by viewing selected videos and counting the turning movements manually. The VCU results were within 1% to 5% of the manual counts, indicating a very high level of reliability.

[13] *See* FEIS page 4-16.

Historic traffic data and staff observations indicate that the peak hour traffic volumes in downtown Barrington are reduced during the summer months due to summer vacations and school not being in session. Using 2007 traffic data previously collected by the Village of Barrington, the 2008 turning movement counts were adjusted to reflect volumes experienced during the fall of 2007. Comparing the July 2008 trends to November 2007 revealed that the 2008 counts were 10% to 20% lower during the peak A.M. and P.M. peak periods, and about 15% higher during the mid-day period. The 2008 counts were adjusted accordingly to reflect conditions typically experienced during the school year, when peak period traffic is highest. Counts taken in the fall of 2008 indicated that this adjustment of the summertime counts was reasonable and verified that the adjusted counts were close to actual volumes during the fall when school is in session.

The 2007 adjusted hourly turning movement count data was used to input driver routing decisions into VISSIM at each roadway intersection within the study area over a typical weekday. Hourly volumes and truck percentages were also used as volume inputs at the entering links of the modeled roadway network.

2. **24-Hour Average Daily Traffic Counts -** A benefit of utilizing a Video Collection Unit at an intersection for a 24-hour period is that a 24-hour daily traffic count can be ascertained on each leg of the intersection. Due to the close proximity of counted intersections to the EJ&E Railroad crossings, and the limited roadway intersections in between, certain 24-hour intersection counts can be used to determine 24-hour Average Daily Traffic (ADT) volumes at the EJ&E highway/railway at-grade crossings with Main Street, Hough Street and Northwest Highway.

3. **Traffic Signal Characteristics -** Existing traffic signal timing and phasing plans were obtained from IDOT and the Village and input into the existing conditions model using VISSIM's ring and barrier controller module. Multiple signal timing plans were input to match current system timings throughout the day. No railroad preemption exists at any of the signalized intersections near railroad crossings.

4. **Intersection Unmet Demand Measurements -** Standard intersection turning movement counts tally the number of vehicles that pass through a given intersection during the count period. At intersections operating below maximum capacity, a turning movement count is an accurate representation of the travel demand at the intersection. However, at intersections that are operating over capacity (i.e. are oversaturated), a turning movement count will not capture the true demand at the intersection for the given time period.

Oversaturated intersections have one or more movements on which all vehicles will not clear the intersection during one traffic signal cycle. Unmet demand is defined as the number of vehicles available to enter the intersection but which are unable to clear their desired intersection movement in one traffic signal cycle.

Unmet demand data was collected in June and July, 2008, from early morning to late evening on all four legs of the IL Route 59/Main Street intersection and IL Route 59/U.S. Route 14 intersection. Unmet demand results were used in the calibration of the existing VISSIM traffic simulation model.

5. **Railway Configurations -** Using a scaled aerial photograph background and field observations, the UP and EJ&E rail lines were input into the VISSIM model.

**6. 24-Hour Railroad Crossing Surveys (EJ&E and UP Trains) -** Video Collection Units were placed at the following highway/railway at-grade crossings for a 24-hour period in June and July of 2008 in order to collect EJ&E and UP train operating characteristics and schedules:

- EJ&E Crossing of Main Street (Lake Cook Road)
- EJ&E Crossing of IL Route 59
- EJ&E Crossing of U.S. Route 14
- UP Crossing of Main Street (Lake Cook Road)
- UP Crossing of IL Route 59

Civiltech staff reviewed each 24-hour video in-house to ascertain the following data from the videos for most of the train events.

- Train type (commuter, commuter express, or freight).
- Direction of travel (inbound/outbound or north/south).
- Number of trains per day.
- Time between the activation of the flashing lights and gates and the arrival of the train.
- Time that the train blocked the crossing.
- Time between the end of the train and the termination of the flashing lights/raising of the gates.
- Train length.
- Train speed.

It should be noted that the observed speeds for existing trains on the EJ&E line were significantly less than CN projected for its freight trains running on the EJ&E. Existing speeds were measured at 16 to 24 mph, while the CN projected average speeds of 37 to 39 mph.

Because of the proximity of the Barrington train station to the UP crossings of Hough Street and Main Street, outbound Metra trains that stop at the Barrington station activate the lights and gates at these two crossings upon their initial approach to the station for approximately 1 to 1-1/2 minutes. Once the outbound Metra train stops at the station, the gates will rise for a short period (depending on the dwell time at the station), then go back down before the train leaves the station and continues northwest bound.

Because the train crossing surveys were completed over a series of different days for the two UP crossings and three EJ&E crossings, the data were compiled to create one schedule for each rail line. For the UP line, the field observations in combination with the published schedule were used to develop the input Metra train schedule.

Likewise, because the surveys were completed over a series of different days, an average train length and speed was determined for each rail line, and in the case of the UP line, for each train type. For the UP rail line, the average Metra train length was 630 feet and the speed was 20 to 30 mph. Freight trains on the UP line were input as 5,000 feet long traveling at 30 mph. On the EJ&E line, freight trains were input as 2,800 feet long traveling at 38 mph.

The compiled train information was input into the 2007 Existing Conditions model for a 24-hour period for both the UP and EJ&E rail lines. Warning devices (flashing lights and gates) were simulated at each highway/railway at-grade crossing. Train detection devices were input and total gate-down times were calibrated based on field and video observations to match existing

conditions.

The Existing Conditions model was first created and run using 2008 traffic volumes so that inputs could be calibrated to reflect actual observed conditions on an hourly basis over a 24-hour period. Calibration was generally achieved by regulating maximum speeds within the core of the downtown. This is a valid calibration method because driveways, minor side streets, and on-street parking were not input into the model. In reality, based on field observations, interaction with these constraints tends to slow the progression of through traffic near the central business district. The speed settings used in the Existing Conditions model were applied identically to the Future Condition models.

Once the 2008 model was calibrated, adjusted 2007 traffic volumes were input to create the 2007 Existing Condition model. Default driver and vehicle characteristics in VISSIM were used throughout all models.

## IX. 2015 NO-ACTION CONDITIONS VISSIM MODEL IN BARRINGTON

### A. Adjustments from the Existing Conditions Model

Once the Existing Conditions model was prepared and calibrated, several adjustments were made to create a 2015 No-Acquisition Conditions model.

**1. Traffic Adjustments** – The DEIS reflected a 3% annual growth rate to adjust historic traffic count data that SEA collected from various sources to the 2007 base year, as well as to project the adjusted 2007 traffic data to the 2015 design year for which impacts of the Proposed Action were measured. In comparing SEA data to historic traffic data available to the Village as well as to 2008 traffic counts that were conducted on area roadways by the Village, it was clear that the 3% annual growth rate significantly overestimated traffic growth in the Village of Barrington. A comparison of 2008 Village traffic counts to 1999 traffic data collected by the Village for their *North-South Arterial Traffic Study*[14] (NSATS) indicated that little or no traffic growth occurred on Village arterial roadways during the previous 9 years.

Therefore, in order to estimate future travel demand, Civiltech obtained 2030 traffic forecasts from the Chicago Metropolitan Agency for Planning (CMAP) for roadways in the study area. Traffic projections for 2015 were then developed by interpolating between the 2030 CMAP forecasts and the Village's 2007 traffic counts. The resulting 2015 forecasts were less than those used by SEA in the DEIS. SEA forecasted about a 27% increase in traffic by 2015 compared to Civiltech's 8% growth forecast. In the Final EIS, SEA updated their existing traffic counts at some crossing locations and adjusted their 2015 forecasts slightly in Barrington.

Table IX-1 shows a comparison of traffic data available from the Village's 1999 study, data used in the 2008 Barrington TIS and data used in the DEIS and the FEIS:

[14] Village of Barrington North-South Arterial Traffic Study, Volume 1 – Existing Conditions Report dated July 19, 2000.

**Table IX-1**
**Average Daily Traffic Volumes on Barrington Roadways at CN Railway Crossings**
**(Vehicles per Day)**

| Roadway | Village NSATS | Barrington TIS | | Draft EIS | | Final EIS | |
|---|---|---|---|---|---|---|---|
| Year | 1999 | 2007 | 2015 | 2007 | 2015 | 2007 | 2015 |
| U.S. Route 14 | 28,100 | 28,500 | 30,700 | 26,573 | 33,662 | 26,800 | 33,949 |
| IL Route 59 | 21,600 | 21,300 | 22,800 | 18,990 | 24,056 | 17,800 | 22,549 |
| Main Street | 19,900 | 18,100 | 19,700 | 11,227 | 14,222 | 11,227 | 14,222 |

The Barrington TIS traffic data shown above was also used in the 2011 TIS Update.

**2. Traffic Signals Adjustments –** Based on the assumption that traffic signal timings would be re-optimized by IDOT between now and 2015 to account for traffic volume growth, traffic signals were re-optimized throughout the network for the 2015 No-Action model using Synchro software. Identical revised traffic signal timings were carried through to each of the Proposed Action models as well.

**3. Train Adjustments -** For the EJ&E line, the 2015 No-Action Conditions model included the same number of trains as observed under existing conditions (five trains). The existing EJ&E train lengths and speeds were adjusted to match the assumptions used in the DEIS for the No-Action condition (2,800 feet long at 38 mph). No adjustments were made to the UP trains or schedule.

The 2015 No-Action Conditions model used the existing pre-train arrival gate down times and post-train departure gate up times that were observed for the EJ&E line crossings. Due to the design of the railroad warning signal circuits on the EJ&E line, some of these pre and post gate down times are substantially longer than the minimum Federal requirements.

## X. 2015 POST-ACQUISITION MODELS IN BARRINGTON

### A. Adjustments from the 2015 No-Action Conditions Model

Once the 2015 No-Action Conditions model was completed, only the train settings were adjusted in the creation of 2015 Acquisition Scenario models to reflect projected CN train operations. No adjustments were made to roadway traffic volumes, traffic signal or signal system timings, or to the number of UP trains or their schedule.

In the original 2008 Barrington TIS, several different post-Acquisition scenarios were modeled based on CN projections of 2015 train volumes and average speed that were contained in the DEIS. Since CN was not actually running freight trains at the time the Barrington TIS was prepared, no data was available on the times of day CN would operate freight trains. Thus, a train schedule had to be assumed. Because vehicle delays on the roadway network will vary significantly depending upon the time of day that train events occur, modeling a realistic train

schedule is critical to the accuracy of the VISSIM model results.

Since the initial pre-Acquisition Barrington TIS was completed, the STB approved CN's acquisition of the EJ&E rail line and CN began freight operations on the line. Though the freight operations are not as yet up to the levels forecast by CN, it is now possible to develop a more realistic schedule for CN trains for use in the VISSIM models by observing 2011 rail operations.

Between May 12th and June 15th of 2011, the Village observed CN rail operations along a 3,910-foot section of railroad tracks within the Village using two Video Collection Units (VCUs). From the video data, it was possible to determine the number of trains, their direction, the time of day they passed through the Village, and their speeds and lengths. In total, 211 trains were observed during the 35-day observation period. Table A-1 in Appendix A summarizes the results of the train survey.

CN has projected that it would run 20 trains per day through the Village by 2015. The average train length and speed were predicted to be 6,800 feet long and 39 mph respectively. The train data collected by the Village indicated that the current rail traffic averages 6 trains per day – only one extra train added daily over the baseline of five. The trains are running slower than CN predicted (an average speed of 32 mph), and the majority of trains are shorter than predicted (an average length of 5,800 feet). From Table A-1 of the Appendix, it can also be seen that CN typically runs shorter trains during the day (6 A.M. to 6 P.M.) and longer trains at night and in the early morning hours.

The data in Table A-1 was used to develop a forecasted CN Railway train schedule that was input into the VISSIM model for the 2015 Post-Acquisition scenarios. The 20 trains per day that were forecasted by CN in 2015 were spaced throughout the day to mirror the times that CN ran trains during the observation period. In addition, the speeds and lengths of each forecasted train reflected the operating characteristics of CN trains observed during the respective hours.

## B. Post-Acquisition Scenarios

Post-acquisition 24-hour VISSIM models were developed for three scenarios which varied either CN train operations or the street network configuration as described below.

1. **Scenario 1-** This scenario utilizes the roadway traffic volumes, traffic signal and signal system timings, and the UP train volumes and schedule contained in the 2015 No-Action VISSIM model. However, in place of the EJ&E train data, Scenario 1 includes the CN freight train forecasts contained in the DEIS of 20 trains per day. The data developed from the survey of CN rail operations that is shown in Table A-1 was used to develop a forecasted CN Railway train schedule that was input into the VISSIM model for Scenario 1. Table A-2 in Appendix A depicts the estimated Scenario 1 train schedule. The train schedule also varies train speeds and train lengths throughout the day based on existing CN operating characteristics. Train speeds were varied between 30 and 35 mph with an average speed of 32 mph. Train lengths varied between 3,800 feet and 7,800 feet with an average length of 5,835 feet.

2. **Scenario 2-** This scenario is identical to Scenario 1 except that in place of modeling 20 trains that reflect the average observed CN train length of 5,800 feet, Scenario 2 models 20 train events with 17 trains that are each 6,800 feet long (identical to the average length projected by CN), and 3 trains that are 10,000 feet long. This scenario is intended to model the longer train lengths predicted by the CN, as well as to reflect the current trend in railroad freight operations which is to run longer freight trains. The CN ran seven 10,000-foot or

longer freight trains through Barrington during the observation period.

Table A-3 in Appendix A depicts the estimated Scenario 2 train schedule. The train schedule varies train speeds throughout the day based on existing CN operating characteristics. Train speeds were varied between 28 and 35 mph with an average speed of 32 mph to reflect the observed conditions. The 10,000-foot long trains were scheduled at the times of day that the CN actually ran trains of that length through the Village.

3. **Scenario 3-** This scenario is identical to Scenario 1 in terms of the CN train operations that were modeled. Scenario 3 models 20 CN trains in 2015 that reflect the current operating characteristics observed through Barrington (5,800-foot average train length with an average speed of 32 mph). The projected train schedule for Scenario 3 is shown in Table A-2.

Scenario 3 differs from the previous two scenarios, however, in the street network characteristics that were modeled. Scenario 3 models a highway/railway grade separation on U.S Route 14 in place of the existing at-grade crossing.

Scenario 3 did not reroute any vehicular traffic from IL Route 59 onto U.S. Route 14, even though some rerouting to avoid train delays would be likely as a result of the availability of a nearby grade separation. The ability to avoid train delays by using the underpass would reduce the 24-hour train delays at the IL Route 59 crossing.

This scenario also did not reduce gate down times at the IL Route 59 crossing even though changes in track circuits that would be made possible by the grade separation would allow advance warning times at IL Route 59 to be reduced by perhaps 30 seconds or more. This could further reduce 24-hour train delays at the IL Route 59 crossing.

## XI. BARRINGTON VISSIM MODELING RESULTS

The results of the VISSIM modeling that was completed for the 2007 Existing Condition, the 2015 No-Action Condition and the three 2015 Post-Acquisition scenarios are shown in Table XI-1. The results show the total 24-hour vehicle delays measured on the roadway segments that flank the crossings at U.S. Route 14 and IL Route 59 for each of the conditions or scenarios that were modeled. Each result represents the average of the total segment delays obtained from 20 individual computer runs of the respective VISSIM model.

These delay totals include vehicle delays from all sources (both railroad and non-railroad vehicle delays). By subtracting the total delay for the No-Action Condition from that of a post-Acquisition scenario, the 24-hour delay total that is solely attributable to the additional CN Railway train traffic can be determined.

Table XI-1

2011 Village Traffic Impact Study Update – VISSIM Modeling Results

**Comparison of Total Daily Vehicle Delay at CN Railway Crossings**
**In Village of Barrington and City of Aurora**

| VISSIM Model Scenario | Total 24-Hour Roadway Segment Delay (Hours) | | |
|---|---|---|---|
| | Village of Barrington Rail Crossings | | City of Aurora Rail Crossing |
| | U.S. Route 14 | IL Route 59 | U.S. Route 34 |
| **2007 Existing Conditions (Pre-Acquisition)**<br>2007 Traffic with EJ&E Trains (5 trains in Barrington, 16 trains in Aurora) | 207 | 545 | 120 |
| **2015 No-Action Condition (No Acquisition)**<br>2015 Traffic with EJ&E Trains (5 trains in Barrington, 16 trains in Aurora) | 467 | 1,085 | 180 |
| **STB Criterion for Substantial Effect** Change from No Acquisition | ≥40 | ≥40 | ≥40 |
| **2015 Scenario 1 – Post Acquisition without Grade Separations**<br>2015 Traffic with CN Trains (20 @ Avg. 5,800' in Barrington, 40 @ Avg. 5,500' in Aurora) | 583 | 1,149 | 294 |
| Change from No Acquisition | +116 | +64 | +114 |
| **2015 Scenario 2 - Post Acquisition without Grade Separations**<br>2015 Traffic with CN Trains (17 @ 6,800', 3 @ 10,000' in Barrington) | 589 | 1,153 | N/A |
| Change from No Acquisition | +122 | +68 | N/A |
| **2015 Scenario 3 – Post Acquisition with Grade Separations at U.S. Route 14 & U.S. Route 34**<br>2015 Traffic with CN Trains (20 @ Avg. 5,800' in Barrington, 40 @ Avg. 5,500' in Aurora) | 465 | 1,116 | 165 |
| Change from No Acquisition | -2 | +31 | -15 |

## A. Barrington IL Route 59 Crossing Results

From Table XI-1, it can be seen that the 2015 Scenario 1 train traffic will result in an increase in total vehicle delay of 64 hours over a 24-hour period at the IL Route 59 crossing compared to the No-Action Condition. Scenario 1 represents 20 trains per day that average 1,000 feet less than the train lengths predicted by CN in 2015.

The total delay increase of 64 hours is significantly greater than the 19-hour delay increase predicted in the FEIS for this crossing.[15] This difference demonstrates how much the rudimentary DEIS methodology underestimated the actual delays caused by the Acquisition in Barrington. Moreover, the 64-hour delay increase is about 1½ times the "substantial effect" threshold of 40 hours. Thus, the IL Route 59 crossing will be substantially affected by the Acquisition as a result of the crossing delay criterion in addition to the queue length criterion that was previously identified in the DEIS.

Post-Acquisition trains longer than those currently operating in Barrington will increase vehicle delays at IL Route 59 even more. With the longer trains modeled under Scenario 2, the IL Route 59 crossing will experience an increase in vehicle delay of 68 hours over a 24-hour period.

## B. Barrington U.S. Route 14 Crossing Results

The VISSIM modeling results are even more pronounced at the U.S. Route 14 crossing. From Table XI-1, it can be seen that the 2015 Scenario 1 train traffic will result in an increase in total vehicle delay of 116 hours over a 24-hour period at the U.S. Route 14 crossing compared to the No-Action Condition.

The total delay increase of 116 hours is significantly greater than the 29-hour delay increase predicted in the FEIS for this crossing[16] and it is nearly 3 times the "substantial effect" threshold of 40 hours. Thus, contrary to the findings of the FEIS, the U.S. Route 14 crossing will, in fact, be substantially affected by the Acquisition.

Trains longer than those currently operating in Barrington will increase vehicle delays at U.S. Route 14 even more. With the longer trains modeled under Scenario 2, the U.S. Route 14 crossing will experience an increase in vehicle delay of 122 hours over a 24-hour period.

Scenario 3 in the Village of Barrington models a highway/railroad grade separation on U.S. Route 14. The results for Scenario 3, which are shown in Table XI-1, indicate that contrary to the findings of the VOBTOA,[17] the delay reduction benefits of a grade separation at U.S. Route 14 will be substantial, even without any capacity improvements at upstream or downstream signalized intersections.

Railroad crossing delays on U.S. Route 14 attributable to the Acquisition will be eliminated with construction of a grade separation, but the benefits will extend well beyond U.S. Route 14 itself. IL Route 59 will see substantial benefits as well. Post-Acquisition delays at the IL Route 59 CN

[15] Table A.5-1 in the FEIS Appendix A-5 predicts a Proposed Action delay increase at IL Route 59 of 1,164.8 minutes or 19.4 hours.
[16] Table A.5-1 in the FEIS Appendix A-5 predicts a Proposed Action delay increase at U.S. Route 14 of 1,757.8 minutes or 29.3 hours.
[17] *See* VOBTOA page 48.

crossing will be reduced by more than 50% because traffic flow across that crossing will no longer have to interact with the effects of simultaneous traffic flow interruptions on U.S. Route 14. Had HDR modeled a grade separation alternative in the VOBTOA, it would not have incorrectly concluded that a grade separation would have no benefit without intersection capacity improvements.

## XII. COMPARISONS TO CN CROSSING AT U.S. ROUTE 34 IN AURORA

The EJ&E crossing at U.S. Route 34 (Ogden Avenue) in the City of Aurora was one of two crossings SEA concluded warranted construction of a grade separation as an appropriate measure to mitigate the substantial effects of the Proposed Action. Using the rudimentary DEIS methodology to determine the increase in total crossing delay caused by the Acquisition, SEA calculated that the total 24-hour delay increase would be 54 hours, which is above the STB's threshold for substantial impact of 40 hours. The FEIS stated the following regarding the U.S. Route 34 crossing in the Final Recommended Conditions:[18]

> *Ogden Avenue (US 34) presently carries a very high volume of traffic, reflecting its importance to mobility in the region. Indeed, as noted by CMAP, US 34 is a Strategic Regional Arterial (CMAP 2008). This designation confirms the importance of US 34 to the region's mobility. Moreover, alternate routes are not readily available in the vicinity of the highway/rail at-grade crossing. US 34 also meets the total vehicle delay and exposure criteria used in SEA's analysis of the Proposed Action. Because of these transportation and safety factors, as well as high vehicle volume on the roadway, the excessive amount of delay, the importance of the roadway, and the lack of viable alternate routes, SEA has concluded that grade separation would be warranted and appropriate mitigation for this roadway.*

The magnitude of the impacts of the Proposed Action at U.S. Route 34 was so great, that the STB ordered the CN to pay 67% of the cost of constructing the grade separation improvement.

The U.S. Route 14 crossing in Barrington has many factors in common with the U.S. Route 34 crossing in Aurora. They are both SRA routes that carry very high volumes of traffic and that have no viable alternate routes. In fact, the nearest alternative grade-separated crossing of the railroad to U.S. Route 14 (the Rand Road crossing) is more than twice as far away as the nearest alternative grade-separated crossing to U.S. Route 34 (the McCoy Drive crossing). Moreover, Route 14 has other important factors that do not exist in Aurora, such as a nearby crossing rail line, a nearby crossing major arterial highway and other factors which affect the ability of traffic queues to discharge freely, . Table XII-1 shows a comparison of existing and future conditions at both locations.

From Table XII-1, it can be seen that though the two crossings have many similarities, the Ogden Avenue crossing is predicted to carry twice the number of trains in 2015 as the U.S. Route 14 crossing and 50% more traffic based on SEA's traffic forecast for Ogden Avenue. That additional traffic, however, is more than offset by the facts that the U.S. Route 14 crossing has a nearby major intersection that limits the ability of traffic queues to discharge freely after train events, as well as a crossing railway carrying nearly 70 trains per day that also affects traffic flow at the nearby major intersection.

[18] *See* FEIS Chapter 4 – Final Recommended Conditions, page 4-16.

In order to provide a valid comparison of the impacts of the Acquisition at the two crossings using an accurate measuring tool, VISSIM models were developed for the U.S. Route 34 crossing to compare vehicle delay impacts to those measured with VISSIM at the CN Railway crossings in Barrington.

**Table XII-1**

**Comparison of CN Railway Crossings of U.S. Route 14 in Barrington and U.S. Route 34 in Aurora**

| Comparison | U.S. Route 14 | U.S. Route 34 |
|---|---|---|
| SRA Route | Yes | Yes |
| Nearby Rail Line that also Impacts Traffic Flow | Yes | No |
| Nearby SRA Route that also Impacts Traffic Flow | Yes | No |
| Nearby Available Alternate Route | No | No |
| Travel Distance to Nearest Alternate Grade Separation | 4-6 miles | 2-3 miles |
| 2007 Average Daily Traffic Volume | 28,500 vpd | 36,400 vpd |
| 2015 Average Daily Traffic Volume | 30,700 vpd[1] | 46,110 vpd[2] |
| Existing Roadway Capacity Constraints | Yes | Yes |
| Potential Queue Discharge Delays | Yes | No |
| Meets FHWA Exposure Criterion | No[3] | Yes |
| Pre-Acquisition Daily Train Volumes | 5 trains | 16 trains |
| Post-Acquisition Daily Train Volumes | 20 trains<br>300% increase | 40 trains<br>150% increase |
| Increase by 2015 in Total Daily Vehicular Delay at Crossing due to CN Freight Trains | 116 to 122 hours | 114 hours |
| Designated as Substantially Affected Crossing in FEIS | No[4] | Yes |
| Increase in Hours of Daily Vehicular Delay in 2015 Due to CN Freight Traffic | +116 to +122 | +114 |

Notes:

[1] Civiltech's Village of Barrington forecast. The FEIS forecast was 33,949 vpd. The U.S. Route 14 forecast ADT is the third highest of any of the roads that cross the EJ&E.

[2] FEIS forecast.

[3] Although the Lynwood crossing also fell short of that exposure factor criterion, the Board found that it should be grade separated.

[4] The rudimentary analysis methodology first employed by HDR coupled by their inadequate VISSIM analysis led to U.S. Route 14 being left off the list of "substantially affected" crossings for the entire environmental review process.

## XIII. 2007 EXISTING CONDITIONS VISSIM MODEL IN AURORA

A 2007 Existing Conditions VISSIM model was developed for the U.S. Route 34 crossing in order to evaluate the same 2007 existing conditions that served as the baseline (pre-Acquisition) conditions that were analyzed in the DEIS. Similar to the procedure used in Barrington, 24-hour turning movement counts were conducted at signalized intersections adjacent to the railroad crossing using VCU's to develop 2011 traffic volumes. These volumes were then adjusted backwards to match the 2007 volumes reported in the DEIS. Using these data along with 2007 EJ&E train data contained in the DEIS, a 2007 Existing Conditions VISSIM model was developed at Ogden Avenue. The model was run 20 times and the delay results were averaged to develop the Total 24-hour Roadway Segment Delay value that was reported in Table XI-1 for the crossing.

## XIV. 2015 NO-ACTION CONDITIONS VISSIM MODEL IN AURORA

### A. Adjustments from the Existing Conditions Model

For the EJ&E line, the 2015 No-Action Conditions model included the same number of trains as observed under existing conditions (16 trains). The existing EJ&E train lengths and speeds were adjusted to match the assumptions used in the DEIS for the No-Action condition (3,900 feet long at 32 mph). The 2015 No-Action Conditions model used the current pre-train arrival gate down times and post-train departure gate up times that were observed for the CN line crossing in 2011.

## XV. 2015 POST-ACQUISITION MODELS IN AURORA

### A. Adjustments from the 2015 No-Action Conditions Model

Once the 2015 No-Action Conditions model was completed for Ogden Avenue, only the train settings were adjusted in the creation of 2015 Post-Acquisition Scenario models to reflect projected CN train operations. No adjustments were made to roadway traffic volumes, traffic signal or signal system timings.

CN is currently operating trains on the former EJ&E rail line, though its freight operations are not as yet up to the levels forecast by CN. A projected 2015 train schedule for this crossing was developed for use in the VISSIM models by observing 2011 rail operations.

Between June 27$^{th}$ and June 30$^{th}$ of 2011, CN rail operations were recorded at the crossing using a VCU. From the video data, it was possible to determine the number of trains, their direction, time of day they passed through the City, and their speeds and lengths. In total, 60 trains were observed during the 3-day observation period. Train speeds ranged between 26 mph and 42 mph with an average speed of 34 mph. Train lengths ranged between 3,500 feet and 8,800 feet with an average length of 5,500 feet. Table A-4 in Appendix A details the results of the train survey.

CN has projected it would run 40 trains per day through the City of Aurora by 2015. The average train length and speed were predicted to be 6,200 feet long and 39 mph, respectively. The observed train data indicated that the current rail traffic averages 20 trains per day. The trains are running slower than CN predicted (an average speed of 34 mph), and the majority of

trains are shorter than predicted (an average length of 5,500 feet).

The observed train operational data in Table A-4 were then used to develop a 2015 projected CN Railway train schedule at Ogden Avenue for the 40 train movements predicted for the Acquisition in a similar manner to the schedule developed in Table A-2 for Barrington. Table A-5 depicts the estimated Scenario 1 and Scenario 3 train schedule. The train schedule varies train speeds and train lengths throughout the day based on existing CN operating characteristics. Train speeds were varied between 26 and 42 mph with an average speed of 34 mph. Train lengths varied between 3,500 feet and 8,800 feet with an average length of 5,500 feet.

## B. Post-Acquisition Scenarios

Post-Acquisition 24-hour VISSIM models which varied either CN train operations or the street network configuration were developed for two scenarios as described below for the U.S. Route 34 crossing.

1. **Scenario 1-** This scenario utilizes the roadway traffic volumes and traffic signal and signal system timings contained in the 2015 No-Action VISSIM model for Ogden Avenue. However, in place of the EJ&E train data, Scenario 1 includes the CN freight train forecasts contained in the DEIS of 40 trains per day along with use of current train operating patterns as observed this year. Table A-5 (Appendix A) depicts the estimated Scenario 1 train schedule.

2. **Scenario 3-** This scenario is identical to Scenario 1 in terms of the CN train operations that were modeled. However, Scenario 3 differs from Scenario 1in the street network characteristics that were modeled. Scenario 3 models a highway/railway grade separation on U.S Route 34 in place of the existing at-grade crossing.

## C. Aurora VISSIM Modeling Results

The results of the VISSIM modeling that was completed for the 2007 Existing Condition, the 2015 No-Action Condition and the two 2015 Post-Acquisition scenarios are shown in Table XI-1. The results show the total 24-hour vehicle delays measured on the roadway segment that flanks the crossing at U.S. Route 34 for each of the conditions or scenarios that were modeled. Each result represents the average of the total segment delays obtained from 20 individual computer runs of the respective VISSIM model.

These delay totals include vehicle delays from all sources (both railroad and non-railroad vehicle delays). By subtracting the total delay for the No-Action Condition from that of a Post-Acquisition scenario, the 24-hour delay total that is solely attributable to the additional CN Railway train traffic can be determined.

From Table XI-1, it can be seen that the 2015 Post-Acquisition under Scenario 1 train traffic will result in an increase in total vehicle delay of 114 hours over a 24-hour period at the U.S. Route 34 crossing compared to the No-Action Condition. Scenario 1 represents 40 trains per day that average 700 feet less than the train lengths predicted by the CN Railway in 2015. The total delay increase of 114 hours is significantly greater than the 54-hour delay increase predicted in the FEIS for this crossing.[19]

[19] Table A.5-1 in the FEIS Appendix A-5 predicts a Proposed Action delay increase at U.S. Route 34 of 3,244.2 minutes or 54.1 hours.

Scenario 3 in the City of Aurora models a highway/railroad grade separation on U.S. Route 34 at the CN Railway. The results for Scenario 3 that are shown in Table XI-1 indicate that, as one would expect, the delay reduction benefits of a grade separation will be substantial.

## XVI. COMPARISON OF IMPACTS AT THE BARRINGTON U.S. ROUTE 14 AND AURORA U.S. ROUTE 34 CROSSINGS

In recommending a grade separation as the appropriate mitigation measure for the substantial impacts that the Acquisition will cause at the U.S. Route 34 crossing in Aurora, SEA cited the following critical factors in the Final Recommended Conditions that set this crossing apart from all but one other:[20]

- U.S. Route 34 presently carries a very high volume of traffic, reflecting its importance to mobility in the region.
- U.S. Route 34 is a Strategic Regional Arterial, further confirming its importance to the region's mobility.
- Alternate routes are not readily available in the vicinity of the highway/rail at-grade crossing.
- U.S. Route 34 would experience an excessive amount of delay as a result of the Proposed Action that is well above the STB's substantial effect criterion.
- U.S. Route 34 meets the FHWA exposure criteria for consideration of a grade separation.

When measured against the above criteria, the conditions and impacts at the U.S. Route 14 crossing in Barrington are comparable to those at the U.S. Route 34 crossing in Aurora.

- U.S. Route 14 carries very high traffic volumes and is one of the most heavily traveled roadways in the area, reflecting its importance to mobility in the region. Its ADT is third highest of all crossings on the EJ&E – higher even that that of U.S. Route 30 in Lynwood.
- U.S. Route 14 is designated as an SRA route, further confirming its importance to the region's mobility.
- Alternate routes are not readily available in the vicinity of the U.S. 14 highway/rail at-grade crossing. In fact, all other nearby available routes not only cross the CN Railway, but they cross the UP rail line as well.
- U.S. Route 14 will experience an excessive amount of delay as a result of the Acquisition that is well above the STB's substantial effect criterion. When measured using the appropriate analysis tool, the delay increase that will result from the Acquisition at U.S. Route 14 is 116 hours per day compared to a 114-hour increase at U.S. Route 34.

[20] *See* FEIS Chapter 4 – Final Recommended Conditions, page 4-16. The other crossing recommended for a grade separation was the U.S. Route 30 crossing in the Village of Lynwood.

The only criterion cited by SEA that the U.S. Route 14 crossing falls short on compared to the Aurora crossing is that the FHWA exposure factor is less than one million. However, it should be noted that the U.S. Route 30 crossing in Lynwood, IL, which was the only other crossing recommended by SEA for a grade separation, also fell below the FHWA exposure factor threshold. Despite the fact that U.S. Route 14 fell below the threshold, the U.S. Department of Transportation Federal Highway Administration has awarded the Village of Barrington a Tiger II Grant to undertake Phase I engineering work for a grade separation at this crossing. VISSIM modeling of grade separation alternatives at both the U.S. Route 34 and the U.S. Route 14 crossings demonstrated comparable congestion relief benefits.

## XVII. TRAFFIC IMPACT STUDY UPDATE – SUMMARY OF FINDINGS

### A. Material Errors in FEIS

As a result of the original 2008 *Village of Barrington CN Railway Traffic Impact Study* and this 2011 *Traffic Impact Study Update*, Civiltech has identified several significant material errors and omissions that led to incorrect or unsupported conclusions in the FEIS.

In preparing the *Village of Barrington Traffic Operational Analysis* (VOBTOA), HDR, on behalf of SEA, used the same high-level traffic simulation modeling software in the FEIS that Civiltech used to reevaluate traffic impacts of the Acquisition in Barrington. However, HDR applied that software to just peak hours, which are times of voluntary CN train curfews, rather than over 24 hours, which was the period used by the Board to evaluate substantial effects. The afternoon simulation in the VOBTOA was also terminated 20 minutes after a single P.M. peak hour train event, even though vehicle queues from that train had not fully dissipated. These errors were compounded by measuring peak period delay increases over the entire street network rather than at individual crossings, further diluting the impacts of additional CN trains.

Having measured delays during times of limited train activity and having averaged them over a large area of the street network, HDR caused SEA to conclude that congestion will not considerably worsen as a result of the Acquisition. This conclusion was reached despite the fact that HDR's high-level analyses predicted queue length increases on Village streets of between ¼ and ½-mile as a result of the Acquisition.

Based on HDR's narrow application of modeling for the FEIS, SEA erroneously concluded that the traffic analyses validated SEA's rudimentary methodology for evaluating traffic delay and confirmed the conclusions reached in the DEIS. SEA reached those conclusions despite the fact that the analyses HDR presented did not validate any 24-hour DEIS delay results at crossings in Barrington that were calculated using SEA's initial rudimentary analysis procedure.

SEA also concluded that grade separations in Barrington were not reasonable and feasible alternatives for mitigation. This conclusion was reached without any apparent analyses of the delay reduction benefits of grade separations and was unsupported by any facts or data regarding the feasibility of grade separations in the Village.

The combination of material errors and unsupported conclusions contained in the FEIS calls into question whether impacts of the Acquisition on crossings in the Village of Barrington were measured without bias and under the same standards as other crossings on the EJ&E line.

## B. Village of Barrington Traffic Impact Study Update Findings

The results of the VISSIM studies performed for the 2011 *Village of Barrington Traffic Impact Study Update* are in substantial opposition to the findings and conclusions in the DEIS and the FEIS. Following are the major findings from the updated analyses:

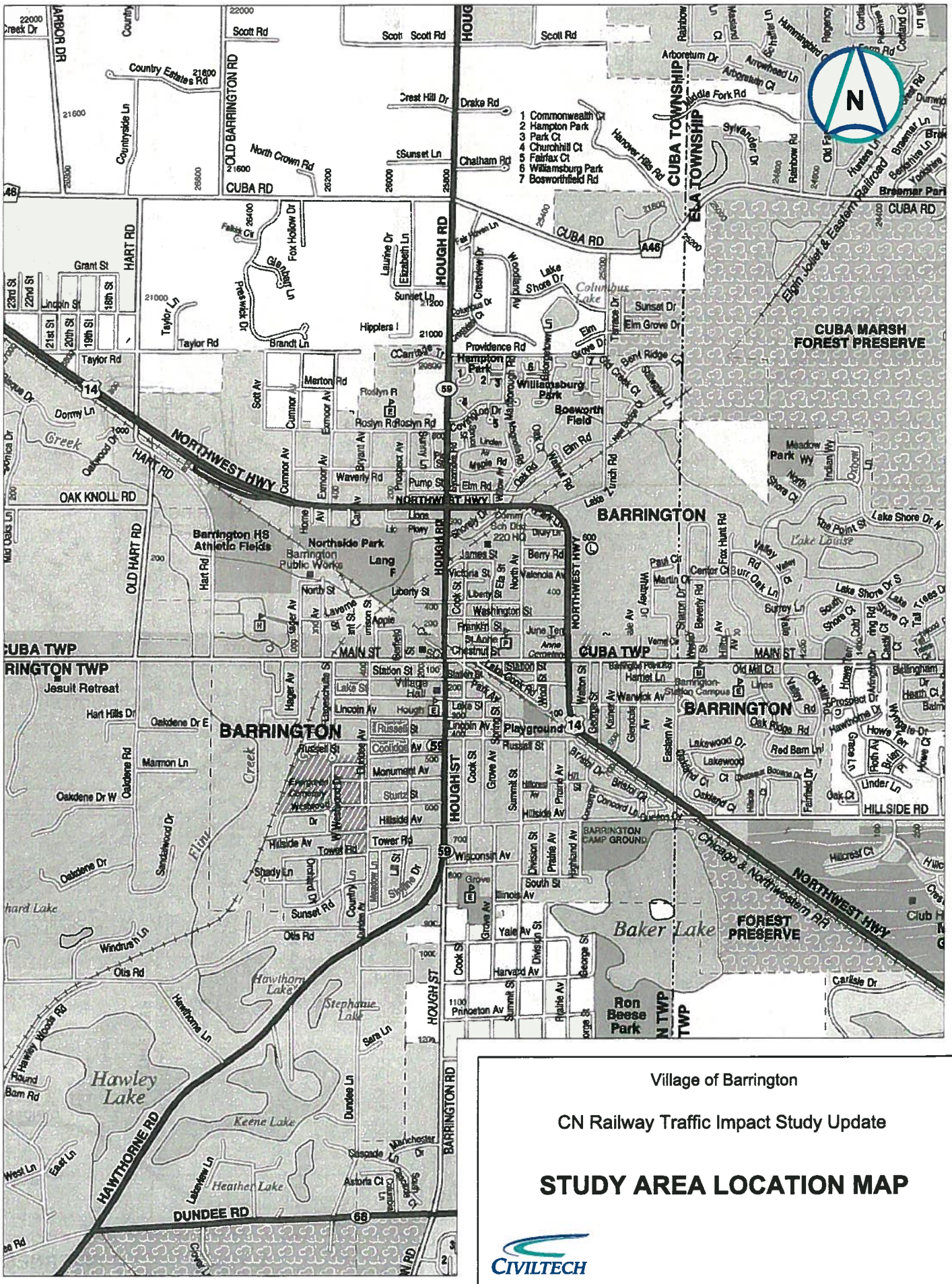
- Using the high-level VISSIM traffic simulation model instead of SEA's rudimentary analysis procedure, this study found that both the IL Route 59 and the U.S. Route 14 crossings would be "substantially affected" by the Proposed Action according to STB criteria. Depending upon which future train scenario is utilized:
    - IL Route 59 would experience an increase in total 24-hour rail crossing delay of between 64 and 68 vehicle-hours as a result of the Acquisition. This is more than 50% greater than the STB substantial effect criterion.
    - U.S. Route 14 would experience an increase in total 24-hour rail crossing delay of between 116 and 122 vehicle-hours as a result of the Acquisition. This is 2 ½ to 3 times the STB substantial effect criterion.
- A similar VISSIM analysis was conducted for the U.S. Route 34 crossing of the CN Railway in the City of Aurora to compare impacts of the Acquisition to those in Barrington using the same analysis tool. The VISSIM model for U.S. Route 34 predicted an increase in total 24-hour rail crossing delay of 114 vehicle-hours as a result of the Acquisition. SEA characterized the level of delay at this crossing as "excessive". Due in part to the magnitude of the delay increase, SEA recommended construction of a rail/highway grade separation at the U.S. Route 34 crossing.
- As the VISSIM study demonstrates, the magnitude of the delay increase at the U.S. Route 14 crossing is similar to the delay increase at U.S. Route 34, despite the fact that the Aurora crossing is projected to carry twice as many trains and 50% more roadway traffic than the U.S. Route 14 crossing. This result is due to the unique complexity of Barrington's street system and the delays caused by interactions with the crossing UP rail line that are not shared with other communities along the former EJ&E line.
- The U.S. Route 34 crossing was cited by SEA in their recommendation to grade separate it as a heavily traveled Strategic Regional Arterial route that did not have any nearby available alternate routes. U.S. Route 14 is also a heavily traveled SRA route that does not have any nearby alternate routes that could be used to avoid train delays. In fact, all nearby routes not only cross the CN Railway, but they cross the UP Railroad as well.
- The VISSIM modeling in Barrington predicted a substantial benefit to the Village roadway network as a result of grade separating the U.S. Route 14 crossing. That grade separation would reduce 2015 total 24-hour vehicle delays on both IL Route 59 and U.S. Route 14 to nearly the levels expected under the No-Acquisition scenario.
- The only criterion cited by SEA that the U.S. Route 14 crossing falls short on compared to the Aurora crossing is that the FHWA exposure factor is less than one million. However, despite that fact, the USDOT has awarded the Village a Tiger II Grant to undertake Phase I engineering work for a grade separation at this crossing.

These findings demonstrate that the impacts of the Acquisition in the Village of Barrington will not only be substantial, but at the U.S. Route 14 crossing (which will be the only U.S. Route which crosses the EJ&E that lacks a grade separation), they will be at a level that justifies construction of a grade separation to mitigate those impacts.

# Appendix A

EXHIBITS AND TABLES

**Exhibits**




Village of Barrington

CN Railway Traffic Impact Study Update

# STUDY AREA LOCATION MAP

CIVILTECH

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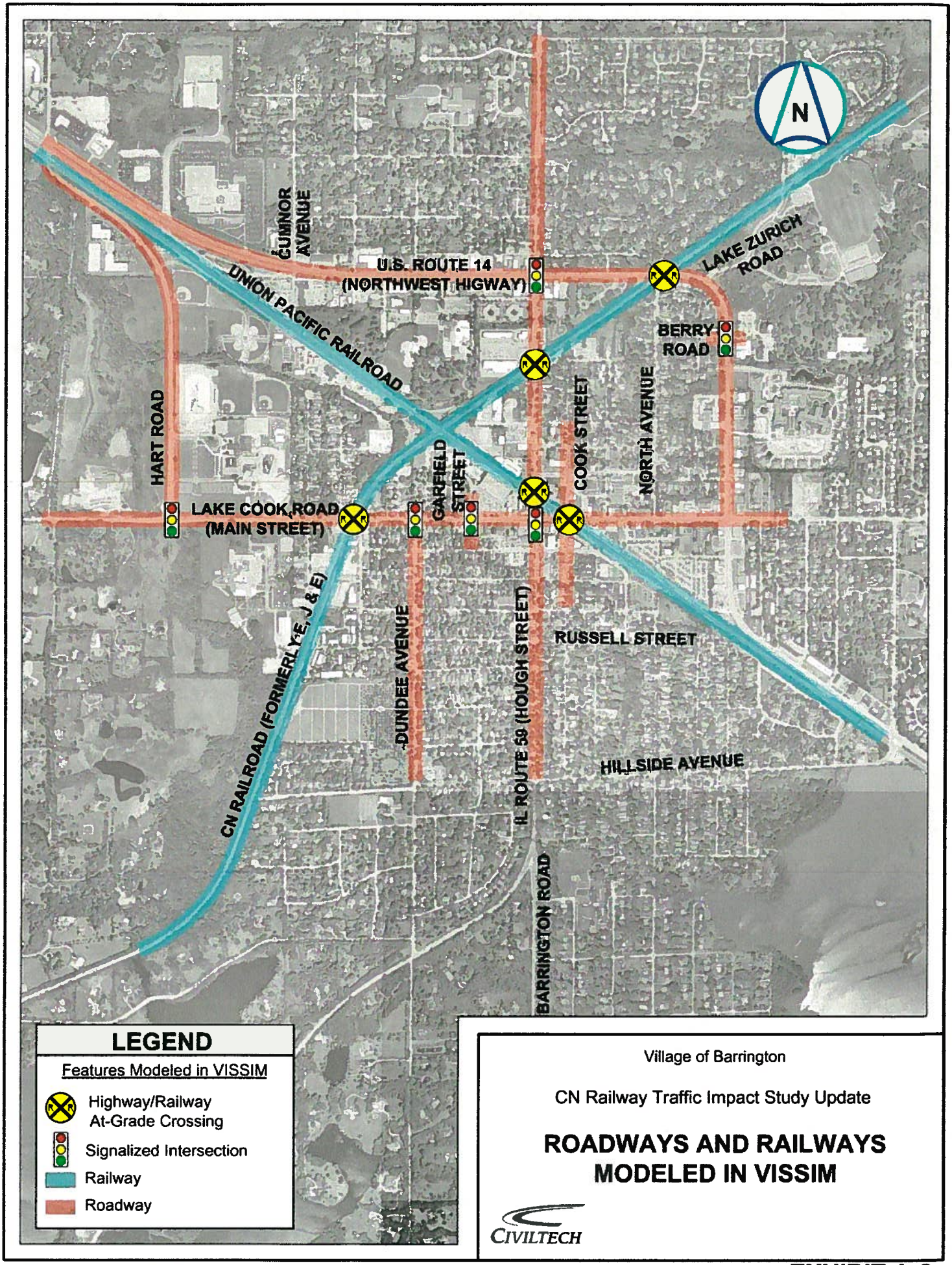
**EXHIBIT A-1**




Village of Barrington

CN Railway Traffic Impact Study Update

## ROADWAYS AND RAILWAYS MODELED IN VISSIM

CIVILTECH

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**EXHIBIT A-2**

# Tables

# Table A-1
## Village of Barrington CN Railway Train Survey Results
May 12, 2011 through June 15, 2011

| | |
|---|---|
| Length of Measurement Segment: | 3,910 ft |
| A.M. Peak Period for Vehicles: | 6:30 - 8:30 A.M. |
| P.M. Peak Period for Vehicles: | 4:00 - 6:00 P.M. |
| Number of valid train observations collected: | 211 |
| Maintenance Trucks Observed: | 13 |
| Train Stoppages Observed: | 6 |

| | |
|---|---|
| Northbound Trains: | 92 |
| Southbound Trains: | 119 |

| | |
|---|---|
| Trains greater than 6,800 feet long observed: | 87 (41%) |
| Trains greater than 10,000 feet long observed: | 7 (3%) |
| Average train speeds less than 39 mph: | 184 (87%) |

*Trains by Time of Day (Observed over 35 Days)*

| Hour Start | Number of Trains | Average Obs. Per Day | Average Speed (mph) | Average Length (ft) |
|---|---|---|---|---|
| 12:00 AM | 5 | 0.14 | 34 | 7,760 |
| 1:00 AM | 6 | 0.17 | 30 | 7,767 |
| 2:00 AM | 9 | 0.26 | 32 | 6,422 |
| 3:00 AM | 11 | 0.31 | 33 | 7,382 |
| 4:00 AM | 11 | 0.31 | 32 | 7,209 |
| 5:00 AM | 10 | 0.29 | 32 | 7,800 |
| 6:00 AM | 3 | 0.09 | 27 | 5,800 |
| 7:00 AM | 5 | 0.14 | 33 | 6,580 |
| 8:00 AM | 13 | 0.37 | 30 | 5,777 |
| 9:00 AM | 11 | 0.31 | 32 | 5,209 |
| 10:00 AM | 10 | 0.29 | 33 | 4,800 |
| 11:00 AM | 10 | 0.29 | 34 | 3,770 |
| 12:00 PM | 14 | 0.40 | 30 | 5,236 |
| 1:00 PM | 11 | 0.31 | 34 | 4,245 |
| 2:00 PM | 13 | 0.37 | 34 | 4,838 |
| 3:00 PM | 8 | 0.23 | 33 | 5,850 |
| 4:00 PM | 11 | 0.31 | 35 | 4,073 |
| 5:00 PM | 11 | 0.31 | 30 | 5,191 |
| 6:00 PM | 4 | 0.11 | 30 | 7,025 |
| 7:00 PM | 9 | 0.26 | 28 | 7,056 |
| 8:00 PM | 4 | 0.11 | 33 | 5,150 |
| 9:00 PM | 7 | 0.20 | 30 | 6,443 |
| 10:00 PM | 8 | 0.23 | 32 | 6,400 |
| 11:00 PM | 7 | 0.20 | 34 | 6,043 |
| Total | 211 | 6.03 | 32 | 5,800 |

*Trains by Day of Week (Observed over 35 days)*

| Day | Number of Observations | Trains per Day | Average Speed (mph) | Average Length (ft) |
|---|---|---|---|---|
| Monday | 39 | 8 | 31 | 5,400 |
| Tuesday | 29 | 6 | 32 | 5,200 |
| Wednesday | 30 | 6 | 30 | 5,400 |
| Thursday | 28 | 6 | 34 | 5,600 |
| Friday | 34 | 7 | 32 | 5,926 |
| Saturday | 24 | 5 | 35 | 7,167 |
| Sunday | 27 | 5 | 31 | 6,596 |
| Total | 211 | 6 | 32 | 5,800 |

From the observations, a "typical" CN train currently running through the section during this period had a length of 5,800 feet and a speed of 32 mph.

There was an overall average of 6 trains per day running on the section during this period.

The busiest day for train traffic was Monday, with 18.5% of the train traffic during this period, or about 8 trains throughout the day.

## Table A-2
## Projected 2015 CN Railway Train Schedule
2015 Proposed Action - Scenarios 1 and 3

| Occurrence # | Direction | Time | Speed (mph) | Length |
|---|---|---|---|---|
| 1 | NB | 1:15 AM | 30 | 7,800 |
| 2 | SB | 2:25 AM | 32 | 6,400 |
| 3 | SB | 3:40 AM | 33 | 7,400 |
| 4 | NB | 4:30 AM | 32 | 7,200 |
| 5 | SB | 5:10 AM | 32 | 7,800 |
| 6 | NB | 8:45 AM | 30 | 5,800 |
| 7 | NB | 9:20 AM | 32 | 5,200 |
| 8 | SB | 10:50 AM | 33 | 4,800 |
| 9 | NB | 11:35 AM | 34 | 3,800 |
| 10 | SB | 12:15 PM | 30 | 5,200 |
| 11 | NB | 12:40 PM | 30 | 5,200 |
| 12 | NB | 1:15 PM | 34 | 4,200 |
| 13 | SB | 2:05 PM | 34 | 4,800 |
| 14 | NB | 3:30 PM | 33 | 5,900 |
| 15 | SB | 4:10 PM | 35 | 4,100 |
| 16 | SB | 5:25 PM | 30 | 5,200 |
| 17 | NB | 7:35 PM | 28 | 7,100 |
| 18 | SB | 9:10 PM | 30 | 6,400 |
| 19 | NB | 10:45 PM | 32 | 6,400 |
| 20 | SB | 11:30 PM | 34 | 6,000 |
| Averages | | | 32 | 5,835 |

## Table A-3
## Projected 2015 CN Railway Train Schedule
2015 Proposed Action - Scenario 2

| Occurrence # | Direction | Time | Speed (mph) | Length |
|---|---|---|---|---|
| 1 | NB | 1:15 AM | 30 | 10,000 |
| 2 | SB | 2:25 AM | 32 | 6,800 |
| 3 | SB | 3:40 AM | 33 | 6,800 |
| 4 | NB | 4:30 AM | 32 | 6,800 |
| 5 | SB | 5:10 AM | 32 | 6,800 |
| 6 | NB | 8:45 AM | 30 | 6,800 |
| 7 | NB | 9:20 AM | 32 | 10,000 |
| 8 | SB | 10:50 AM | 33 | 6,800 |
| 9 | NB | 11:35 AM | 34 | 6,800 |
| 10 | SB | 12:15 PM | 30 | 6,800 |
| 11 | NB | 12:40 PM | 30 | 6,800 |
| 12 | NB | 1:15 PM | 34 | 6,800 |
| 13 | SB | 2:05 PM | 34 | 6,800 |
| 14 | NB | 3:30 PM | 33 | 6,800 |
| 15 | SB | 4:10 PM | 35 | 6,800 |
| 16 | SB | 5:25 PM | 30 | 10,000 |
| 17 | NB | 7:35 PM | 28 | 6,800 |
| 18 | SB | 9:10 PM | 30 | 6,800 |
| 19 | NB | 10:45 PM | 32 | 6,800 |
| 20 | SB | 11:30 PM | 34 | 6,800 |
| Averages | | | 32 | 7,280 |

## Table A-4
## City of Aurora CN Railway Train Survey Results
June 27, 2011 through June 30, 2011

| Hour Start | Number of Trains | Average Obs. Per Day | Probability of Train | Average Obs. For 40 Trains | Number of Trains in Hour | Average Speed (mph) | Average Length (ft) |
|---|---|---|---|---|---|---|---|
| 12:00 AM | 4 | 1.3 | 6.7% | 2.7 | 3 | 35 | 7,100 |
| 1:00 AM | 3 | 1.0 | 5.0% | 2.0 | 2 | 26 | 3,900 |
| 2:00 AM | 2 | 0.7 | 3.3% | 1.3 | 1 | 36 | 5,700 |
| 3:00 AM | 3 | 1.0 | 5.0% | 2.0 | 2 | 33 | 6,000 |
| 4:00 AM | 4 | 1.3 | 6.7% | 2.7 | 3 | 40 | 6,000 |
| 5:00 AM | 3 | 1.0 | 5.0% | 2.0 | 2 | 30 | 4,000 |
| 6:00 AM | 0 | 0.0 | 0.0% | 0.0 | 0 | 0 | 0 |
| 7:00 AM | 1 | 0.3 | 1.7% | 0.7 | 0 | 38 | 4,500 |
| 8:00 AM | 1 | 0.3 | 1.7% | 0.7 | 0 | 35 | 7,300 |
| 9:00 AM | 3 | 1.0 | 5.0% | 2.0 | 2 | 37 | 6,800 |
| 10:00 AM | 1 | 0.3 | 1.7% | 0.7 | 1 | 33 | 6,100 |
| 11:00 AM | 1 | 0.3 | 1.7% | 0.7 | 1 | 39 | 6,700 |
| 12:00 PM | 4 | 1.3 | 6.7% | 2.7 | 3 | 28 | 6,300 |
| 1:00 PM | 3 | 1.0 | 5.0% | 2.0 | 2 | 40 | 6,900 |
| 2:00 PM | 1 | 0.3 | 1.7% | 0.7 | 1 | 40 | 4,200 |
| 3:00 PM | 4 | 1.3 | 6.7% | 2.7 | 3 | 42 | 5,300 |
| 4:00 PM | 2 | 0.7 | 3.3% | 1.3 | 1 | 37 | 6,500 |
| 5:00 PM | 4 | 1.3 | 6.7% | 2.7 | 3 | 38 | 4,000 |
| 6:00 PM | 3 | 1.0 | 5.0% | 2.0 | 2 | 26 | 4,900 |
| 7:00 PM | 1 | 0.3 | 1.7% | 0.7 | 0 | 26 | 6,500 |
| 8:00 PM | 6 | 2.0 | 10.0% | 4.0 | 4 | 28 | 3,500 |
| 9:00 PM | 2 | 0.7 | 3.3% | 1.3 | 1 | 43 | 7,200 |
| 10:00 PM | 3 | 1.0 | 5.0% | 2.0 | 2 | 31 | 5,200 |
| 11:00 PM | 1 | 0.3 | 1.7% | 0.7 | 1 | 40 | 8,800 |
| Total | 60 | 20.0 | 100.0% | 40 | 40 | 34 | 5,500 |

## Table A-5
## Projected CN Railway Train Schedule at U.S. Route 34
2015 Proposed Action Scenarios 1 and 3
(Expansion to Double Track Crossing)

| No. | Arrival at Crossing | Direction | Speed (mph) | Length (Ft.) |
|---|---|---|---|---|
| 1 | 12:10 AM | NB | 35 | 7,100 |
| 2 | 12:25 AM | SB | 35 | 7,100 |
| 3 | 12:45 AM | NB | 35 | 7,100 |
| 4 | 1:20 AM | SB | 26 | 3,900 |
| 5 | 1:45 AM | NB | 26 | 3,900 |
| 6 | 2:35 AM | NB | 36 | 5,700 |
| 7 | 3:10 AM | SB | 33 | 6,000 |
| 8 | 3:45 AM | NB | 33 | 6,000 |
| 9 | 4:05 AM | SB | 40 | 6,000 |
| 10 | 4:30 AM | NB | 40 | 6,000 |
| 11 | 4:50 AM | SB | 40 | 6,000 |
| 12 | 5:15 AM | NB | 30 | 4,000 |
| 13 | 5:40 AM | SB | 30 | 4,000 |
| 14 | 9:05 AM | NB | 37 | 6,800 |
| 15 | 9:45 AM | SB | 37 | 6,800 |
| 16 | 10:25 AM | SB | 33 | 6,100 |
| 17 | 11:35 AM | NB | 39 | 6,700 |
| 18 | 12:10 PM | SB | 28 | 6,300 |
| 19 | 12:25 PM | NB | 28 | 6,300 |
| 20 | 12:45 PM | SB | 28 | 6,300 |
| 21 | 1:25 PM | NB | 40 | 6,900 |
| 22 | 1:50 PM | SB | 40 | 6,900 |
| 23 | 2:30 PM | SB | 40 | 4,200 |
| 24 | 3:05 PM | NB | 42 | 5,300 |
| 25 | 3:30 PM | SB | 42 | 5,300 |
| 26 | 3:45 PM | NB | 42 | 5,300 |
| 27 | 4:25 PM | NB | 37 | 6,500 |
| 28 | 5:00 PM | SB | 38 | 4,000 |
| 29 | 5:25 PM | NB | 38 | 4,000 |
| 30 | 5:50 PM | SB | 38 | 4,000 |
| 31 | 6:15 PM | NB | 26 | 4,900 |
| 32 | 6:40 PM | SB | 26 | 4,900 |
| 33 | 8:05 PM | SB | 28 | 3,500 |
| 34 | 8:15 PM | NB | 28 | 3,500 |
| 35 | 8:35 PM | SB | 28 | 3,500 |
| 36 | 8:45 PM | NB | 28 | 3,500 |
| 37 | 9:25 PM | NB | 43 | 7,200 |
| 38 | 10:15 PM | SB | 31 | 5,200 |
| 39 | 10:40 PM | NB | 31 | 5,200 |
| 40 | 11:30 PM | SB | 40 | 8,800 |
| Averages | | | 34 | 5,500 |

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